CLAIMS

1. A sorption module comprising a generator section (7) connected via a first passage (3) to a condenser section (21), wherein the module contains a sorbent material (1) within its generator section (7) and a quantity of sorbate fluid characterised in that the condenser section (21) is connected by a second passage (25) to an evaporator section (26), the generator (7), condenser (21), and evaporator (26) sections being so arranged or interlinked such that liquid in the condenser section (21) is encouraged to flow to the evaporator section (26) and discouraged from flowing to the generator section (7) and the quantity of sorbate fluid and pressure within the module is such that, when the sorbent material is saturated with adsorbed or absorbed sorbate and at its lowest anticipated operating temperature, the evaporator section (26) is substantially filled with sorbate liquid (28).

2. A sorption module according to claim 1 characterised in that the evaporator section (26) is located below the condenser section (21) and the second passage (25) is downwardly extending whereby liquid in the condenser section (21) is encouraged to flow into the evaporator section (26) under action of gravity.

3. A sorption module according to claim 1 or 2 characterised in that the first (3) and second (25) passages comprise adiabatic sections (20, 25).

4. A sorption module according to claim 1, 2 or 3 characterised in that the condenser (21) and / or evaporator (26) sections have a surrounding arrangement of heat-conducting fins (22, 27).

5. A sorption module according to claims 1, 2, 3 or 4 characterised in that the generator section (7) has an external arrangement of heat-

conducting fins (4).

6. A sorption module according to any preceding claim characterised in that the generator section (7) has an internal arrangement of heat-conducting fins (5) with one or more voids (6) sufficient to permit gas transport therebetween.

7. A sorption module according to claim 6 characterised in that the sorbent material (1) is solid and packed between the internal fins (5).

8. A sorption module according to claim 6 wherein the sorbent material (1) is liquid and the first passage (3) extends upwardly within the sorbent tube, its opening being located above the uppermost level of liquid sorbent.

9. A sorption module according to any one of claims 1 to 6 characterised in that the sorbent material is chosen from one of the group of active carbons, zeolites, silica gels, metal halides, metal alloys, water or a combination thereof.

10. A sorption module according to claim 9 characterised in that the sorbate fluid is chosen from one of the group of ammonia, water, alcohols, hydrogen, hydrocarbons, hydrofluorocarbons and carbon dioxide.

11. A sorption module according to any preceding claim characterised in that it further includes a porous plug (29) of inert material within the second passage (25).

12. A thermal compressive device comprising:

a plurality of generator modules (7) arrayed in two banks (10, 11) within a duct (9), each generator module (7) containing a sorbent material (1)

and a sorbate fluid;

a heat exchange system in fluid communication with the generator modules (7) wherein the sorbate fluid is arranged to evaporate and / or condense;

a heating zone (13) located intermediate the two banks (10, 11) of generator modules (7); and

reversible fluid driving means (12) arranged to drive a heat carrier fluid along the duct (9) across the generators (7) within one bank (10, 11), through the heating zone (13) and across the generators (7) within the other bank (11, 10) and *vice versa*.

13. A thermal compressive device according to claim 12 characterised in that each generator module (7) has a central axis, the central axes of the generators being substantially aligned in a direction perpendicular to a plane occupied by the bank (10, 11) in which they are arrayed.

14. A thermal compressive device according to claim 13 characterised in that each generator module (7) has an internal arrangement of heat-conducting fins (5) with one or more voids (6) therebetween, sufficient to permit gas transport.

15. A thermal compressive device according to claim 14 characterised in that the sorbent material (1) is solid and packed between the internal fins (5).

16. A thermal compressive device according to any one of claims 13 to 15 characterised in that each generator module (7) has an external arrangement of heat-conducting fins (4).

17. A thermal compressive device according to claim 16 characterised in that the generators (7) and external fins (4) within each bank (10, 11) are linked to form a series of fin-tube blocks (8), wherein each block (8) comprises a series of laminar strips of heat-conducting material (4) stacked about the generator modules (7), stacking direction being substantially parallel to the central axes of the generator modules, the modules (7) being arranged in a row along a length of the stacked strips, such that each is surrounded by the heat-conducting material which thereby forms the linked fins (4), and the fin-tube blocks (8) within each bank (10, 11) are arranged such that they present successive rows of generator modules (7) to the heat carrier fluid when it is driven along the duct (9).

18. A thermal compressive device according to any one of claims 12 to 17 characterised in that the heating zone (13) contains a heat source extending across the duct (9) for a distance approximately equal to that for which the banks (10, 11) extend across the duct (9).

19. A thermal compressive device according to any one of claims 12 to 18 characterised in that the heat carrier fluid is air.

20. A thermal compressive device according to any one of claims 12 to 19 characterised in that the heat exchange system comprises at least one condenser or cooler (16) connected via an expansion valve (17) to an associated evaporator (18); each generator module (7) has a connecting passage (3); and each bank (10, 11) of generator modules (7) is connected from the generator connecting passages (3) first to the condenser or cooler (16) via a respective one-way outlet valve (14) or a respective assembly of one-way outlet valves (14), the one-way outlet valves (14) allowing fluid flow from the generator modules (7) to the condenser or cooler (16), and secondly to the evaporator (18) via a respective one-way inlet valve (15) or a respective assembly of one-

way inlet valves (15), the one-way inlet valves (15) allowing fluid flow from the evaporator (18) to the generator modules (7).

21. A thermal compressive device according to claim 20 characterised in that the connecting passages (3) of all generator modules (7) in each respective bank are interconnected to form a single channel with first and second branches, the first branch being connected via the single outlet valve (14) to the condenser or cooler (16) and the second branch being connected via the single inlet valve (15) to the evaporator (18).

22. A thermal compressive device according to claim 20 when dependent on claim 16, characterised in that the connecting passages (3) of all generator modules (7) in a single fin-tube block (8) are interconnected to form a single channel with first and second branches, all fin-tube blocks (8) in a respective bank (10, 11) thereby having an assembly of such channels, each channel having its first branch connected to the condenser or cooler (16) via a respective one of the assembly of outlet valves (14) and its second branch connected to the evaporator (18) via a respective one of the assembly of inlet valves (15).

23. A thermal compressive device according to claim 20 characterised in that each generator module connecting passage (3) is connected to the condenser or cooler (16) via a respective one of the assembly of outlet valves (14) and to the evaporator (18) via a respective one of the assembly on inlet valves (15).

24. A thermal compressive device according to any one of claims 12 to 19 characterised in that each generator module (7) is a component of a sealed sorption unit, the sorption unit also comprising a condenser / evaporator module (21) and a first connecting passage (3), by which means the condenser / evaporator module (21) is in fluid communication with the generator module (7), and wherein the sorption

units are oriented such that the condenser / evaporator modules (21) are arrayed in two banks, corresponding to those of the generator modules (7), located outside of and below the duct (9).

25. A thermal compressive device according to claim 24 characterised in that each condenser / evaporator module (21) has an external arrangement of heat conducting fins (22).

26. A thermal compressive device according to claim 25, wherein each sorption unit has a central axis, the central axes of the sorption units being substantially aligned in a direction perpendicular to planes occupied by the banks (10, 11) in which they are arrayed and each generator module (7) has an external arrangement of heat-conducting fins characterised in that the sorption units (7, 21) and external fins (4, 22) within each bank (10, 11) are linked to form a series of fin-tube blocks (8), wherein each block (8) comprises two series of laminar strips of heat-conducting material (4, 22) stacked about the sorption units in the vicinities of the generator module (7) and condenser / evaporator module (21), stacking direction being substantially parallel to the central axes of the sorption units, the units being arranged in a row along a length of the stacked strips, such that each is surrounded by the heat-conducting material which thereby forms the linked fins (4, 22), and the fin-tube blocks (8) within each bank (10, 11) within the duct (9) are arranged such that they present successive rows of generator modules (7) to the heat carrier fluid when it is driven along the duct (9).

27. A thermal compressive device according to any one of claims 12 to 19 characterised in that each generator module (7) is a component of a sealed sorption module, the sorption module being in accordance with any one of claims 1 to 11, wherein the sorption modules are oriented such that the condenser (21) and evaporator (26) sections are arrayed

in respective pairs of banks, each pair corresponding to the banks of the generator modules (7), located outside of and below the duct (9).

28. A thermal compressive device according to claim 27, wherein each sorption module has a central axis, the central axes of the sorption modules being substantially aligned in a direction perpendicular to planes occupied by the banks (10, 11) in which they are arrayed and each generator module (7), condenser section (21) and evaporator section (26) has an external arrangement of heat-conducting fins characterised in that the sorption modules (7, 21, 26) and external fins (4, 22, 27) within each bank (10, 11) are linked to form a series of fin-tube blocks (8), wherein each block (8) comprises three series of laminar strips of heat-conducting material (4, 22) stacked about the sorption modules in the vicinities of the generator modules (7), condenser (21) and evaporator (26) sections, stacking direction being substantially parallel to the central axes of the sorption modules, the sorption modules being arranged in a row along a length of the stacked strips, such that each is surrounded by the heat-conducting material which thereby forms the linked fins (4, 22, 27), and the fin-tube blocks (8) within each bank (10, 11) within the duct (9) are arranged such that they present successive rows of generator modules (7) to the heat carrier fluid when it is driven along the duct (9).

29. An air conditioning system having a thermal compressive device as claimed in any one of claims 12 to 28.

30. A refrigerator having a thermal compressive device as claimed in any one of claims 12 to 28.

31. A heat pump having a thermal compressive device as claimed in any one of claims 12 to 28.

32. A thermal transformer having a thermal compressive device as claimed in any one of claims 12 to 28.